CONTRACT FILE

STATINTL

TECHNICAL DISCUSSION

CENTRAL CHEMICAL MIXING SYSTEM

10 JUNE 1960

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[redacted]

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TECHNICAL DISCUSSION

CENTRAL CHEMICAL MIXING SYSTEM

TABLE OF CONTENTS

SECTION I

SCOPE

1. INTRODUCTION - This technical proposal describes a centralized chemical support facility to be associated with an existing photographic processing facility. The system will include, but not be limited to, facilities for replenishment, temperature control, filtering, water treatment, silver recovery and solution analysis and control.

This proposal is based on the requirements as covered by correspondence and conferences between the using activity and the [redacted] STATINTL

Figure 1-1 presents the general arrangement schematic for the system, which is the result of an engineering survey to determine the components most suitable. Detailed placement of the proposed system at the installation site will be delineated when architectural data is available.

2. WORK TO BE PERFORMED - [redacted] will design, fabricate and install the necessary equipment. All materials and workmanship will be of the highest quality suitable for the intended use. The system design will conform to the highest standards of laboratory practice. All electrical work will conform to the requirements of the National Board of Fire Underwriters, National Electrical Code. Only materials manufactured in the United States will be utilized. STATINTL

3. FACILITIES - [redacted] will utilize the water, sewage and electrical power provided to the area of installation as GFE. STATINTL

4. ACCEPTANCE - Contractor will instruct the laboratory personnel in the operation of the equipment during which time any revisions or adjustments deemed necessary will be performed. When it is demonstrated that the equipment is fully satisfactory and capable of accepting the normal work load, acceptance will be granted by the using activity.

5. WARRANTY - The system will be designed for convenient operation and maintenance of all equipment. All components, assemblies and workmanship will be guaranteed by [redacted] STATINTL against any failure caused by defects in workmanship or material for a period of one (1) year from the date of final acceptance of the work. If failure should occur in any of the foregoing within the guarantee period, prompt and satisfactory correction will be rendered by the [redacted] Washington, D.C. STATINTL Service Office.

SECTION II

SYSTEM

1. SYSTEM LOCATION - The proposed system schematically shown in Figure 1-1 is to be located and installed within an area 20 x 40 feet on a second floor level, approximately 15 feet above the processing operation. The solution analysis and control equipment will be placed in a room adjacent to this area.

The system will be connected to the existing processing equipment and/or other use areas so as to be compatible with the requirement and properly integrated to insure correct and convenient operation.

2. SYSTEM COMPONENTS - The system is comprised of the following principal components:

a) Two (2) fifty gallon capacity mix and rejuvenation tanks

b) Five (5) 100-gallon capacity mix and rejuvenation tanks

c) Seven (7) solution mixers (1/3 HP)

d) Seven (7) solution transfer pumps

e) Seven (7) solution filters

f) Two (2) 50-gallon storage and replenishment tanks (Nitrogen pressurized)

g) Five (5) 320-gallon storage and replenishing tanks (Nitrogen pressurized)

h) Two (2) 500 cc flowraters (for use with item f)

i) Five (5) solution return pumps (for use with item g)

j) Solution temperature control system (for use with items f and g)

k) One (1) silver recovery unit

l) Central solution replenishment control

m) Necessary valves and plumbing

3. COMPONENT UTILIZATION

3.1 The mix and rejunevation tanks (a and b) are used for the initial mix and rejuvenation of photographic solutions as required for the preparation of initial solutions and recovery of depleted solutions.

3.2 Each tank is provided with a 1/3 HP portable chemical solution mixer and floating tank lids. The floating lids are used to inhibit aerial oxidation. Each tank is also provided with a pump and filter for the purpose of transferring the solution. The pump is connected so as to allow for transfer of the solution to the bulk storage and replenishment tanks through the provided filter. The solution may be supplied directly to the processor for expeditious initial loading. The transfer pump discharge is connected to permit the return of the solution to the mix tank if desired to provide additional mixing capabilities. The mix system is designed to allow for the preparation of approximately 50% of its capacity without aerial oxidation caused by turbulation or the introduction of a vortex.

3.3 The transfer pumps, as well as all pumps used in this system, are manufactured by [redacted] and are as shown in the enclosed brochure and data sheet. These pumps are designed especially for the handling of photographic solutions. STATINTL

The pump body, face plate and impeller are molded of chemically resistant plastic. The face plate "O" ring seal is of neoprene. The shaft is of Type 316 stainless steel. The rotary mechanical seal is made of graphitar and operates under slight pressure against a stainless steel insert, providing a drip-proof pump. All pumps regardless of output requirement are identical in dimension and construction, the only difference being in the impeller design and motor horsepower. This assures complete interchangeability of all pump parts which in turn require a minimum of supporting spare parts.

3.4 The filter for photographic solutions is manufactured by this contractor and is capable of filtration of particles down to 10 microns. Filtration of particles smaller than this size in photographic solutions creates the possibility of partially removing certain developing agents rendering the solution inadequate for its intended use. (Water filtration is discussed in Section IV). The solution filter system is equipped with a filter by-pass which may be utilized while changing the filter elements. The filters are constructed of rigid, unplasticized, polyvinyl chloride. The filters have replaceable elements made of highly tentacular fibers, precision wound in a honeycomb spiral pattern. This allows for a depth filtration which given large contaminate holding capacity presenting a positive non-rupturing filter surface. The filter elements are prewound on tubes of a chemically resistant material, for support. A pressure gage is installed in the filtering system to indicate the pressure drop caused by filter loading. This assists in determining the necessity of filter cartridge replacement.

3.5 The storage and replenishment tanks (f and g) are used for the bulk storage of process chemicals and as a reservoir for the replenishment solution supply. These vessels are pressurized to 5 inches water gauge with nitrogen gas supplied through a regulating system to prevent the introduction of any oxidizing agent into the solution. The cover for the vessels is designed for ease of removal and proper sealing. A pressure relief valve is provided to eliminate the possibility of excessive pressure within the vessel.

3.6 The pressurized vessels are provided with a temperature control system to maintain solution temperatures to a desired setting within plus or minus 1° F. or better.

The temperature exchange will be accomplsihed by refrigeration compressors and heaters. [redacted] transistorized thermistor controllers will be used as sensors. The temperature controller actuating the magnetic motor starters on the refrigeration compressors and the magnetic relay on the solution heaters will be installed as required. STATINTL

The temperature controller is illustrated in Figure 3-3. The magnetic relays controlling the refrigeration and heaters will be connected so as to prevent simultaneous operation of both the hot and cold cycles. The actuating knob to adjust the temperature will be located remotely from the tank as is the controller assembly, being connected to the tank where the sensing probes are installed through water-tight conduit.

The sensing probe placed in the solution tanks, is a temperature sensitive resistor (thermistor) element encased in a glass bead. The thermistor bead is in turn encased in a Type 316 stainless steel bulb.

The bridge circuit into which the sensing probe is connected remains at a balance condition when the sensing probe and the adjustable element, in the form of a control potentiometer, are at an equal setting.

At such time as the variation in the sensing element caused by a change in the temperature of the solution in the tank, or when an adjustment of the control potentiometer is made, the bridge is out of balance and supplies a signal to the amplifier.

The amplifier which receives its input from the bridge circuit is completely transistorized and terminates in a control relay which supplies the actuating voltage to the refrigeration or heater actuator relays.

The actuator relay, receiving its signal from the control relay and amplifier section passes the voltage to the refrigeration units or the heaters, as required, effecting a change in temperature of the solution within the tank.

In order to change the temperature of the solution, it is necessary only to reset the control knob of the potentiometers to the desired setting. The adjustable range of the temperature control is plus 52 ^{o} F. to plus 132^{o} F.

The temperature controller and its associated equipment will function in such a manner so as to insure a plus or minus 0.3° F. stability for the developer solutions. In the case of other solutions, it will not exceed the film manufacturer's recommendations.

The control assembly is transistorized and fabricated with printed circuits featuring a minimum of required maintenance and extended life expectation.

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The solutions in each case flow by gravity to the use area. This flow is controlled by a central solution replenishment control similar to the type as manufactured by [redacted]

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[redacted] In the case of the 320-gallon tanks, the solutions are metered through existing flow-raters provided on the processors. Two 500cc capacity flow-raters (identical to the existing processor flowraters) will be provided for use with the two 50-gallon capacity storage tanks.

At intervals to be determined by subsequent system requirements the solutions from the processing equipment will be pumped to the 100-gallon mixing and rejuvenation tanks for analysis and chemical rejuvenation. These rejuvenated solutions are then transferred to the storage tanks for future use. The solutions supplied from the 50-gallon storage tanks are not returned for rejuvenation after use.

A silver recovery unit will be supplied for the recovery of metallic silver from the hypo solution used for film processing. The system will include the necessary electrolytic cell, rectifier, recirculating pump and argentometer. The size of this unit will be compatible with the system requirement.

4. MATERIALS

4.1 The 50 and 100 gallon capacity tanks will be constructed from Type 316 stainless steel of heliarc welded construction, all welds being ground to a smooth finish. All components fabricated from stainless steel will be pickle passivated.

4.2 The five 320 gallon capacity tanks may be constructed

of stainless steel or wood as desired by the customer. The stainless steel construction will be as described above. The wood slat tanks will be lined with fibre glass impregnated with resin. These tanks will be entirely suitable for the photographic solutions and may be used interchangeably for various solutions. The disadvantage of a glass lined wood tank is that it is not practical to move once installed in place due to the danger of cracking the glass lining. The tanks are lined after installation.

Although the basic cost of the wood tank is low, the on-site installation costs are higher than for stainless steel. The net saving of wood over stainless steel is approximately $200.00 per tank.

4.3 All valves, pipe and pipe fittings will be polyvinyl chloride, rigid and unplasticized. All valves and pipes will be sufficiently sized for the intended purpose.

5. CHEMICAL ANALYSIS AND CONTROL - The necessary equipment for solution analysis and replenishment control will be located in an area adjacent to the described system. [redacted] will furnish the necessary chemical analysis glassware and equipment consisting of pippetts, titration tubes and stand, volumetric flasks, beakers, funnels, reagent bottles, test tubes, lab test thermometers, glass tubing and rods, hot plate, vibrator, and variable speed solution mixer. Other necessary equipment consisting of a sensitometer, densitometer, pH meter, small refrigerator, and reagent cabinet will be considered GFE.

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SECTION III

INSTALLATION

It is contemplated at this time, that the equipment will be installed on the second floor serving use areas and equipment on the first floor directly under, or in the general vicinity of the mix system. The analytical equipment will be located in a room adjacent to the mix system area.

Work will be performed in a neat and workmanlike manner, utilizing sub-contract labor specializing in the appropriate trades, under the supervision of the [redacted] installation engineer. STATINTL

At such time as the required architectural data is available, this contractor will design and integrate this system into the available area. This proposal is based on supplying the fabricated and purchased items necessary to assemble this system within the area of the second floor, and includes the necessary interconnecting plumbing between the system area and use area.

SECTION IV
OPTIONAL ACCESSORY

WATER DEIONIZING-FILTERING PLANT

As an alternate accessory, [redacted] can supply and install in an area on the second floor adjacent to the proposed system a water deionizing-filtration plant. STATINTL

The plant will be installed and integrated into the system to provide water to the mix tanks and other outlets as required in the area.

The requirement for this plant is as yet unknown since the water analysis being performed by [redacted] of Washington, D.C. is not completed. In the event that such analysis indicates that this plant is required, the equipment supplied will be as follows: STATINTL

The plant consists of a water deionizing-filtering assembly rated at 10GPM or 600 GPH. This equipment is capable of high purity output removing all impurities including carbon dioxide and silica. The plant contains a water softener-filter and the entire unit is completely automatic with respect to recharging and recycling, delivering on a continuous basis the equivalent of triple distilled water. This equipment is as manufactured by the [redacted] STATINTL

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Next 3 Page(s) In Document Exempt

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